RETURN CASES IN SCARLATINA: AN ANALYSIS OF EIGHT YEARS.

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THE following investigations were undertaken, firstly, with a view to determining how far the experience of the City Hospital, Edinburgh, corresponded with that of other institutions in regard to "return cases" of scarlatina; and, secondly, to decide whether it were possible to draw any distinction between the type of return cases and that of scarlatina generally.

Cases of scarlatina occurring in a house to which a post-scarlatinal patient has been discharged within the previous six weeks are accepted as return cases. The period is, of course, an arbitrary one, but experience shows that return cases practically never occur after a longer interval. Most fever hospitals, I believe, accept the same convention.

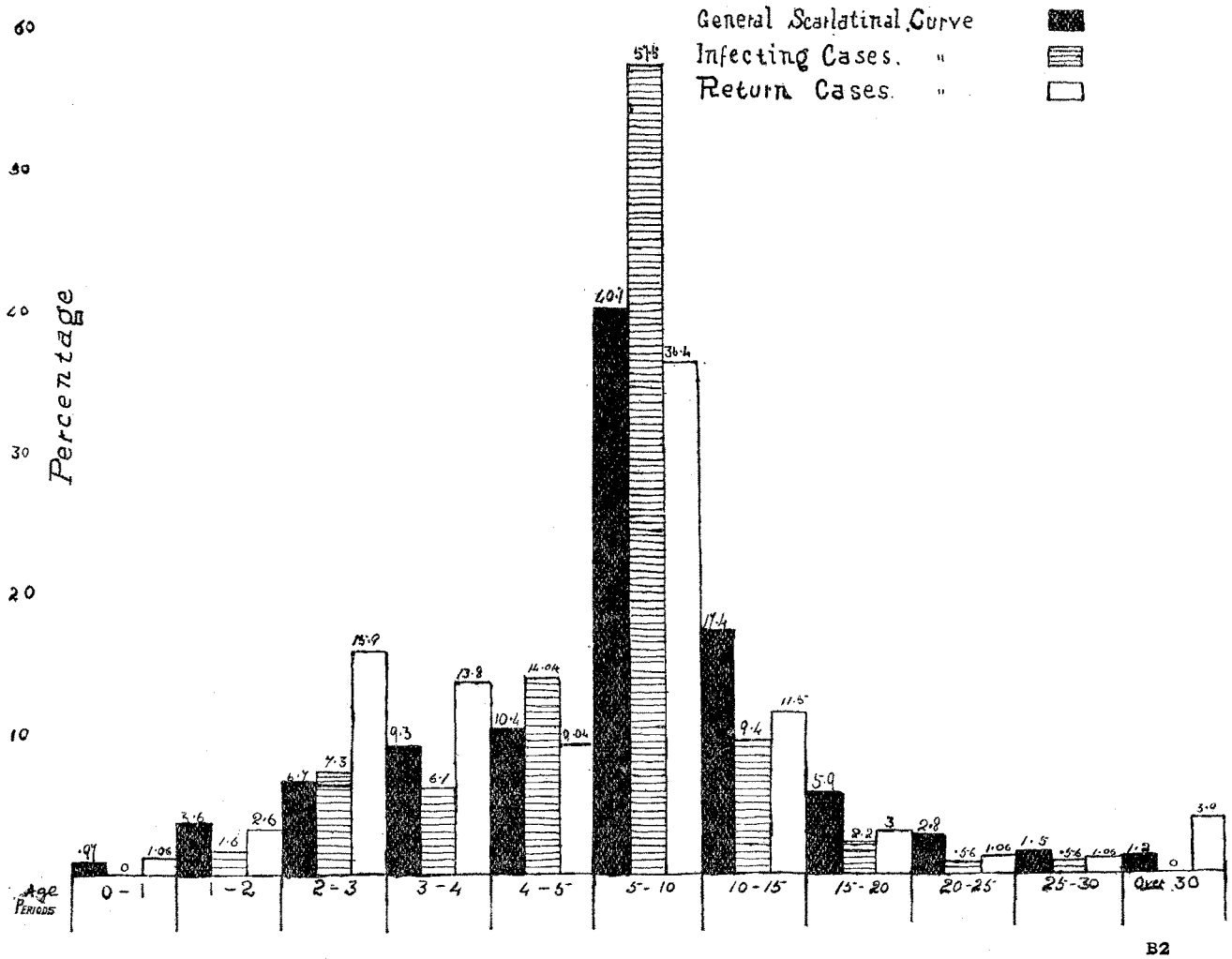
My series is based on the figures for the period 1901-1908 inclusive. During that time 7,748 cases of scarlatina were discharged from hospital. Of those 188 were return cases, which were traced to 178 infecting cases, giving a return-case percentage of 2·42 per cent., and an infecting-case percentage of 2·29 per cent., which may, I think, be considered a fairly satisfactory ratio.

Age Incidence.

The age incidence of both infecting and return cases is shown in Table I, compared with the age incidence of "all scarlatina." The figures for the latter curve are obtained from Foord Caiger's table in "Allbutt's System of Medicine" (1), which is founded on a series of 167,840 cases.

The most obvious deduction to be drawn from these curves is the preponderance of return cases in the first five years of life—42·4 per cent., as against 30·97 per cent. of "all scarlatina," and 29·04 per cent. of infecting

TABLE I.



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cases. This may be ascribed to the fact that children during the first quinquennium are but little affected by school influence and the ordinary sources of scarlatinal infection, while they can be easily infected by a case in the actual home. (This point is also of interest in regard to the so-called "coincidence cases," on which I shall touch later.)

In this particular my results differ from those of Millard (2), who found that the age distribution of his 171 cases corresponded almost exactly with that of his "all scarlatina"—a series of 4,810 cases.

The "over 30" period again shows a rise in the number of return cases—3·9 per cent., as against 1·2 per cent. of "all scarlatina." This group consists entirely of parents infected by their children on return from hospital.

Infecting cases during the first five years correspond closely to "all scarlatina"—29·04 per cent. and 30·97 per cent. In the 5-10 age period, however, they are markedly in excess—57·5 per cent. infecting cases to 40·1 per cent. "all scarlatina." This is in accord with the statement of Cameron (3), who states that a majority of infecting cases occur between four and ten years of age.

In my series there were no infecting cases under one year of age or over thirty.

SEX.

Neither the infecting nor the return cases showed any peculiarity in regard to sex distribution. The former comprised 98 males and 80 females, the latter 93 males and 95 females.

DETENTION OF INFECTING CASES.

Only three of the infecting cases were discharged after a shorter detention than five weeks. Of those two were admitted desquamating, and were discharged after thirty days. The third showed no signs of scarlatina on admission, did not desquamate, and went home after thirty-two days' observation.

TABLE II.

	Under Weeks 5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	Over 12
Cases ...	3	10	48	42	27	13	9	9	17
Percentage	1·6	5·6	26·88	23·5	15·1	7·2	5·05	5·05	9·5

It is noteworthy that no less than 9·5 per cent. were detained over twelve weeks on account of persistent discharges, while only 7·2 per cent. were discharged before six weeks. This is in accord with the now generally accepted view that prolonged detention in hospital is no safeguard against return cases. Sörensen (4), indeed, states that it is the best method of prevention; but as 77 of his 273 cases occurred after a stay in hospital of eleven to twenty days, and most of the remainder after correspondingly short periods, his results cannot be considered parallel with those of observers in this country.

Assuming the usual incubation period of scarlatina to be two to four days, it is not surprising that only 2·65 per cent. of the return cases were admitted within three days of the discharge of the infecting case. It is rather astonishing, however, that no less than 69 per cent. occurred after an interval of a week. Turner (5) in his report to the Metropolitan Asylums Board found the maximum

TABLE III.

INTERVAL BETWEEN DISCHARGE OF INFECTING AND ADMISSION OF RETURN CASE.

Days	1-2	2-3	3-4	4-5	5-6	6-7	7-10	10-14	14-21	21-28	28-42
Cases... ...	3	2	8	15	11	18	40	38	36	13	4
Percentage ...	1·59	1·06	4·24	7·96	5·84	9·55	21·24	20·17	19·11	6·91	2·12

TABLE IV.

TYPE OF INFECTING CASES, RETURN CASES AND ALL SCARLATINA.

	Case Mortality.	S. Anginosa.	Nephritis.	Arthritis.	Otorrhœa.	Rhinorrhœa.	Adenitis.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
All Scarlatina, 1905-08	2·72	4·01	4·55	3·94	9·99	9·63	10·92
Return Cases, 1901-08	2·12	4·25	3·72	3·72	24·46	19·14	26 87
Infecting Cases, 1901-08	—	2·8	5·05	3·37	20·22	16·85	19·66

number of return cases to occur on the fifth day after the discharge of the infecting case, and a steady decline after the seventh. In my series the maximum falls about the seventh day, and the decline does not begin for some days later. Preisich (6) found the interval in 80 per cent. of his cases to be three to fifteen days, but he appears to have included no case occurring after twenty days.

It is of course impossible to draw any very exact deductions from the length of interval. In many cases one obtains histories of the recurrence of discharges after the patient has left hospital; in others the susceptible members of the patient's family may have been sent away before his return home, and are therefore not exposed to infection for some days or weeks.

Type (Table IV).—As the complete complication rates for the first half of the period under consideration are unfortunately not available, I have taken the statistics for the second half (1905-1908) for the purpose of comparison. This comprises 4,411 cases.

In the series of 188 return cases there were four deaths, giving a case mortality of 2·12 per cent. Two of those cases were complicated by diphtheria, and were those deducted the return case mortality would be reduced to 1·06 per cent. Accepting 2·12 per cent., however, it compares favourably with the hospital "all scarlatina" case mortality for 1905-1908, which was 2·72 per cent. It would appear that Edinburgh has been unusually fortunate in this respect. Cameron (7) found a slightly higher case mortality among return cases than the average, though Turner (8), continuing his investigations, found a slight preponderance in the other direction. Millard *(loc. cit.)* found a return case mortality of 7·6 per cent., as against 4·8 per cent. for all scarlatina during the same period. Greenwood (9) and most other writers report return case mortalities above the average.

The percentage of return cases of the anginose type is in my series slightly higher than of "all scarlatina." Among the infecting cases, however, it is distinctly lower—2·8 per cent. against 4·01 per cent. This may be merely a coincidence, but may be due in part to the fact that anginose cases are isolated when in hospital, and, so far as possible, nursed in the open air.

Amongst complications nephritis and arthritis correspond fairly closely in infecting, return, and all cases; but the more specially infectious complications — otorrhœa, rhinorrhœa, and adenitis—show a marked difference. Among the infecting cases this is only to be expected, but it is to be noted that among the return cases those complications are more than twice as frequent as in "all scarlatina." This almost suggest that a strain of scarlatina of an unusually infective type was responsible for those outbreaks.

33·5 per cent. of the infecting cases were quite uncomplicated during their stay in hospital.

Judged by complications alone the type of return case in this series has been distinctly more severe than that of "all scarlatina."

INFLUENCE OF COINCIDENCE AND SO-CALLED "HOSPITALISM."

It is, of course, obvious that the fact of a child developing scarlatina within a few days of its brother's return from hospital does not necessarily mean that the infection has been contracted from the discharged case. In any town where scarlatina is prevalent there are always possibilities of infection from extraneous sources which may be responsible for the second case, as they doubtless were for the first.

Again, however carefully house disinfection is carried out, cases may arise when the parents deliberately deceive the disinfecting officer by concealing some article which has been in close contact with the patient—a new dress or a favourite toy—under the impression that it may be injured by disinfection. Such articles remain untouched until the patient's return from hospital, and, being then produced may act as a source of infection.

Again, though in the present state of ignorance as to the causative agent of scarlatina it is inadvisable to dogmatize as to "carrier cases" and "intermittent infection," it is possible that house disinfection may sometimes altogether fail to accomplish its object owing to the presence of a "carrier" in the house—an individual who has passed through an unrecognised attack, and has remained infective.

In support of the view that some return cases are in reality instances of coincidence, I quote the following cases, all of which occurred in 1908 and 1909:—

M. L. discharged January 31st. J. McD. admitted from the same house on February 1st, *on the third day of the disease.*

H. D. discharged on the evening of Feb. 21st. Her brother, aged ten, developed scarlatina the same night. Unless we assume that the

incubation of scarlatina may be reduced to a few hours, this must be considered as a coincidence.

R. Y. discharged March 11th. His sister admitted February 29th.

M. D. discharged March 27th. A. D., aged four, admitted March 26th.

M. W. discharged July 17th. B. W., aged six, admitted July 10th.

N. C. discharged August 14th. C. C., aged five, admitted July 23rd.

J. S. discharged October 16th. As she was leaving hospital her brother (A. S.), aged twenty, was admitted.

M. R. discharged December 30th. E. R., aged twelve, admitted December 23rd.

M. McG. discharged January 29th. K. McG., aged four, admitted January 13th.

N. McL. discharged March 9th. H. McL., aged six, admitted March 1st. In this case N. McL. had been detained seven weeks and two days in hospital. Had she been discharged after six weeks H. McL. must have been accepted as a return case.

J. H. discharged March 27th. M. H., aged three, admitted March 23rd.

B. S. discharged April 6th. F. S. admitted April 12th *with rubella*.

R. I. discharged June 26th, and went direct to the convalescent home at Campie. Before he had returned home A. I., aged nine, who had never been in contact with him, was admitted on July 14th with scarlatina.

B. T. discharged November 11th. J. T., aged four, admitted October 6th.

R. McN. discharged November 11th. J. McN., aged six, admitted October 21st.

Those cases of second outbreaks of scarlatina occurring within a comparatively short period before the return of the first case from hospital are obviously not due to any infection contracted from the discharged case. Some other source of infection must have been responsible, and it is probable that some of the cases occurring shortly after the discharge of the primary case may be due to similar causes.

It is interesting to note that the majority of those coincidence cases are of higher ages than the one to five age period, which, as I have shown, contains a specially large proportion of return cases.

Greenwood *(loc. cit.)* quotes a series of 101 cases for 1904-1905, in which second cases appeared before the return of the first case from hospital. The majority, however, occurred three to four days after removal, and were doubtless due to infection by contact with the primary case before its dispatch to hospital. During the same period he had 44 secondary cases in houses when the first case was nursed at home. The intervals between the first and second outbreak in such cases varied from one to sixty-five days, with an average of 14·8.

Chapin (10), discussing the value of home isolation in scarlatina, records a series of 1,671 susceptible children sent away from home on the outbreak of scarlatina. After an absence averaging five to six weeks those children returned home, and came into contact with the post-scarlatina patient. Thirty-one, or 1·2 per cent., then developed scarlatina. His results indicate that the prolonged infectivity of scarlatina is a phenomenon not confined to hospital-treated patients.

Newsholme (11), discussing the possible influence of hospitalism in the causation of return cases, admits that such cases occur in undue proportion in connection with hospital-treated cases, but points out that home-treated cases have not hitherto been rigidly investigated in regard to "return" infection, that home-treated cases are generally "picked" cases, nursed under favourable conditions, and that secondary infection when it does occur is usually ascribed to some failure in house disinfection. After an exhaustive study of the whole subject he decides that hospital treatment is a non-essential concomitant, or at the most an auxiliary of protracted or recrudescent infection.

It seems possible, on the other hand, that home influence, to which the patient is exposed on his return from hospital, may be in some cases the cause of a return of infectivity, The indifferent sanitary conditions and the absence of ventilation which prevail in some of the houses of the poorer classes may be sufficient to excite a sore throat, a nasal catarrh, or even perhaps an unobserved relapse in a case which has not developed a complete degree of immunity after its first attack.

The experience of the convalescent home at Campie, to which a certain number of patients are sent after discharge from the City hospital, is of interest in this respect. During the period 1901-1908 there passed through Campie 1,562 cases convalescent after scarlatina, and 1,325 convalescent after other infectious diseases. Among those 1,562 post-scarlatinal cases were 25 which after their return home from Campie caused return cases. Only two case of scarlatina, however, occurred

among the non-scarlatinal convalescents during that time. (It is hardly necessary to remark that convalescent are sent to Campie only after they are presumably quite free from infection.) This might be taken as indicating that under the conditions at Campie—good ventilation, adequate cubic space and sufficient separation in dormitories—the infectivity of those 25 cases remains in abeyance, to be lit up afresh on their return to less hygienic conditions at home.

It must, however, be noted that the non-scarlatinal population at Campie is probably not particularly susceptible to scarlatinal infection. For administrative reasons children under six years of age are not admitted, and a fair proportion of the inmates are adolescents and young adults convalescent from diphtheria and typhoid, many of whom may have been protected by a previous attack of scarlatina.

On the figures obtained from this series of cases I base the following conclusions :—

1. That the return case incidence is unduly heavy on the first five years of life.

2. That the case mortality of return cases is practically the same as that of "all scarlatina."

3. That the more specially infectious complications of scarlatina—otorrhœa, rhinorrhœa, and adenitis—are more frequent in both infecting and return cases than in "all scarlatina."

4. That a certain proportion of so-called return cases are really due to coincidence.

5. That the return to insanitary home conditions may in some cases be the cause of recrudence of infection in a patient who was not infectious when leaving hospital.

I have to thank Dr. C. B. Ker, medical superintendent of the Edinburgh City Hospital, for permission to publish these results.

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THE USE OF DRIED MILK AT INFANTS' MILK DEPOTS.*

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THE increasing use which is being made of dried milk as a food for infants makes the question of its use at infants' milk depots one of special interest to medical officers of health. At the Leicester Infants' Milk Depot dried milk has almost entirely superseded humanized milk, and the results obtained have been very satisfactory. As this change in our practice is of rather a fundamental character, it will be well to consider the advantages and disadvantages of dried milk in detail.

The dried milk used in the Leicester Depot is milk dried by the following process. In this process a thin film of milk is passed over a revolving metal cylinder heated by steam to a temperature considerably above the boiling point (say 250 F.). The temperature being so high and the film of milk very thin, the greater part of moisture in the milk is rapidly dissipated, what remains being afterwards taken up by the milk-sugar as water of crystallization. The film of dried milk is automatically separated by a knife-edge as the cylinder revolves, and is collected in a receptacle below. The process is beautifully simple, and, owing to the duration of the heating process being so extremely short, the composition of the milk solids is altered comparatively little—a very important point.

Dried milk as thus obtained is a coarse, granular, cream-coloured powder, easily miscible with water, in which the greater part of it readily dissolves. The relative proportion of fat, proteids, and lactose remain the same as in the original milk. After reconstitution as liquid milk by the addition of water the consistency, colour, and taste are all found to be somewhat modified, and the fat rises more readily to the surface, owing to the cream globules being ruptured. It is by no means unpalatable, but is not very suitable for use with tea or coffee.

As a food for infants it has one outstanding and all-important advantage, viz., that it is more easily retained—*i.e.*, is more digestible—than fresh cows' milk. Possibly this is due to the fact that it does not tend to form a hard cheesy curd in the stomach, as is so often the case with the latter.

It is only necessary to try dried milk in a few cases of infants who are sick after almost every

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